

**RUBICON**  
Engineering Corporation

July 27, 2007

Project No. 1010.02

Mr. Joe Weidmann  
c/o BOEING REALTY CORPORATION  
4900 E. Conant Street  
Long Beach, California 90808

**Transducer Data  
Technical Memorandum No. 2  
Boeing Realty Corporation  
Former C-6 Facility  
Los Angeles, California**

Dear Mr. Weidmann:

This technical memorandum presents the results of the water level measurements collected at the Boeing Realty Corporation's (BRC) Former C-6 Facility (the site) in Los Angeles, California between September 2006 and April 2007. Water levels were recorded by Rubicon Engineering Corporation (Rubicon) at selected wells at the site using pressure transducers and automated dataloggers during ongoing extraction and injection pilot testing at nearby facilities. A summary of the findings are included as follows:

- Selected wells at the Former Boeing C-6 facility were equipped with pressure transducers to monitor ground water level changes during the Montrose extraction/injection tests. Water levels were recorded during 4 tests, including one extraction and one injection test in both the Gage Aquifer and Bellflower Sand (Table 1).
- Maximum drawdown of 1.6 feet observed in Well MWG-002 (Figure 5), located about 1,800 feet from the Gage Aquifer Well G-EW-1 with an extraction rate of 186 gpm.
- No discernable drawdown observed during Bellflower Sand Well BF-EW-1 extraction test (Figure 6).
- Maximum increase in water level of 0.5 feet observed in Well MWC-17 (Figure 7), located about 2,400 feet from the injection test well in the Bellflower Sand (Well BF-IW-1) with an injection rate of 110 gpm.
- Maximum increase in water level of approximately 0.5 feet observed (Figure 8) in several wells up to 3,000 feet from the Gage Aquifer Well G-IW-1 with an injection rate of 180.

An earlier technical memorandum addressed datalogging activities performed between November 2005 and February 26 (Rubicon Engineering, May 11, 2006). No effects were observed on water levels at the Former C-6 facility from any off-site extraction/injection tests during that time.

Water levels were monitored to detect any potential impact from groundwater extraction and injection between August 30, 2006 through November 15, 2006, and again between March 23 and April 24, 2007. During these time periods, two pilot extraction tests and two pilot injection tests were performed by Hargis + Associates, Inc. (Hargis) on behalf of the Montrose Chemical Corporation (Montrose). A summary of the extraction and injection tests is presented in Table 1. Figure 1 presents a vicinity map showing the location of the Former C-6 facility and other nearby facilities, including Montrose. Figure 1 also shows the locations of Montrose's extraction and injection wells which are screened within the Bellflower Sand (the shallowest water bearing zone) and the underlying Gage Aquifer.

At the Former C-6 facility, a discontinuous mud layer referred to as the Middle Bellflower Mud (MBFM) interrupts the Bellflower Sand, dividing the hydrogeologic unit into the B-Sand (above the MBFM) and C-Sand (below the MBFM). The thickness of the MBFM varies across the site. The B- and C-Sands eventually merge southeast of the Former C-6 Facility as the MBFM pinches out.

To identify potential impacts of the nearby extraction and injection, BRC requested that Rubicon temporarily equip select groundwater monitoring wells at the Former C-6 facility with pressure transducers and dataloggers and report the data as appropriate.

### Field Procedures

A total of 12 monitoring wells were initially equipped with transducers. These included four clusters of wells each having a well screened in the B-Sand, C-Sand, and Gage Aquifer. The locations of the transducer-equipped wells are shown in Figure 2. The corresponding well completion details are shown in Table 2. In addition to these 12 transducers, a barometric transducer and data logger were installed at the site to measure and record barometric pressure at the site. Specifically, the barometric transducer and logger was installed within the well box for Well MWC015.

The transducers were first installed in the monitoring wells on August 30, 2006. The transducers were removed on November 15, 2007 after the extraction pilot tests in Wells G-EW-1 and BF-EW-1 were completed. The transducers were again installed on March 23, 2007 and removed on April 24, 2007 during which time injection tests were performed in Wells BF-IW-1 and G-IW-1 (Table 1). In each monitoring well, a Water Level Logger Model WL15, manufactured by Global Water, was installed. The WL15 is a datalogger and submersible pressure transducer combination designed for automated recording of water levels. The dataloggers were placed within the well boxes and the pressure transducers were suspended below the water table at each well. The transducers were capable of measuring the height of water above the placement depth. The dataloggers were set to record the water levels every 30 minutes.

Each time the transducers were installed, the depth to water at each well was measured manually using an electric well sounder. The depth-to-water measurements, along with the reference

elevations, were used to calculate the initial groundwater elevations corresponding to the transducer water-height measurements.

After installation of the transducers, Rubicon visited the site on several occasions to download the transducer data and manually measure water levels. The manual water level measurements are summarized in Table 3.

### **Data Reduction and Analysis**

The groundwater elevations measured using the pressure transducers between August 30 and November 15, 2006 are shown in Figure 3. The water level elevations measured between March 23 and April 24 are shown in Figure 4. Water level elevations indicate a general increasing trend of approximately 0.3 feet from August 30, 2006 to November 15, 2006 (Figure 3). No general increasing or decreasing trend is apparent during the March 23 to April 24, 2007 monitoring period (Figure 4). Figures 3 and 4 also show that water level elevations in the B-Sand, C-Sand, and Gage Aquifer fluctuated due to changes in barometric pressure, with changes up to 0.3 feet over a 24-hour time period. As seen on Figures 3 and 4, occasional data gaps appear due to data logger malfunctions.

The data presented in Figures 3 and 4 have been broken out in subsequent figures for clarity. Figures 5, 6, 7, and 8 show the water level data collected during the pilot testing periods for Wells G-EW-1, BF-EW-1, BF-IW-1, and G-IW-1, respectively.

The first pilot test that was monitored was a constant rate extraction test that was performed between September 11 and September 16, 2006 in Well G-EW-1, screened in the Gage Aquifer (Hargis + Associates, February 12, 2007). Well G-EW-1 is located approximately 1,400 feet from the southeast corner of the Former C-6 facility. The average extraction rate during the test was 186 gpm. The water level data collected during this time period (Figure 5) indicate a distinct response in the four Gage Aquifer Wells being monitored at the Former C-6 facility (Wells MWG001, MWG002, MWG003, and MWG004). The greatest drawdown observed was approximately 1.6 feet in Well MWG-002, which is nearest to the extraction well. A drawdown of approximately 0.4 feet was also observed in C-Sand Monitoring Wells MWC017 and CMW001. No discernable response was observed in C-Sand Wells MWC009 and MWC015, which are further from the extraction well. Also, no response was apparent in any of the B-Sand monitoring wells.

The second pilot test was performed between October 5 and October 9, 2006 in Bellflower Sand Well BF-EW-1 (Hargis + Associates, March 13, 2007). Well BF-EW-1 is also located approximately 1,400 feet from the Former C-6 Facility (Figure 2). The average extraction rate during the test was 48.1 gpm. During the BF-EW-1 test, no discernable drawdown was observed in any of the wells being monitored at the Former C-6 Facility (Figure 6).

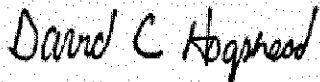
The third pilot test monitored was an injection test performed in Well BF-IW-1 between March 29 and April 1, 2007 (Hargis + Associates, May 1, 2007). Well BF-EW-1 is screened in the Bellflower Sand and is located approximately 2,000 feet southwest of the Former C-6

facility. The average injection rate during the test was 110 gpm. During the test, a measurable response was observed in each of the wells monitored at the site (Figure 7) with the exception of Well WCC\_09S, which is the furthest B-Sand well from Injection Well BF-IW-1. The greatest increase in water level was approximately 0.5 feet in C-Sand Well MWC017.

The final pilot test monitored was an injection test performed in Well G-IW-1 between April 12 and April 17, 2007. Well G-IW-1 is screened in the Gage Aquifer and is also located approximately 2,000 feet southwest of the Former C-6 facility. The average injection rate during the test was approximately 180 gpm. The water level data collected during this time period (Figure 8) indicate a distinct response in the Gage Aquifer Wells being monitored at the Former C-6 facility (Wells MWG002, MWG003, and MWG004). The observed water level rise in these wells was on the order of 0.5 feet.

Respectfully Submitted,

RUBICON ENGINEERING CORPORATION



David C. Hogshead, P.E.  
Senior Engineer

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## REFERENCES

- Hargis + Associates, inc., February 12, 2007, *Interim Data Deliverable, Pilot Extraction Test at Extraction Well G-EW-1, Montrose Site, Torrance, California*. Technical Memorandum submitted to U.S. Environmental Protection Agency, Region IX.
- Hargis + Associates, inc., March 13, 2007, *Interim Data Deliverable, Pilot Extraction Test at Extraction Well BF-EW-1, Montrose Site, Torrance, California*. Technical Memorandum submitted to U.S. Environmental Protection Agency, Region IX.
- Hargis + Associates, inc., May 1, 2007, *Interim Data Deliverable, Pilot Injection Test at Injection Well BF-IW-1, Montrose Site, Torrance, California*. Technical Memorandum submitted to U.S. Environmental Protection Agency, Region IX.
- Hargis + Associates, inc., May 11, 2007, *Interim Data Deliverable, Pilot Injection Test at Injection Well G-IW-1, Montrose Site, Torrance, California*. Technical Memorandum submitted to U.S. Environmental Protection Agency, Region IX.
- Rubicon Engineering Corporation, May 11, 2006, *Technical Memorandum, Transducer Data, Boeing Realty Corporation, Former C-6 Facility, Los Angeles, California*, prepared for Boeing Realty Corporation.

# *Tables*

**Table 1**

**Summary of Extraction/Injection Tests**  
Boeing Realty Corporation, Former C-6 Facility  
Los Angeles, California

Well Name	Type	Aquifer	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet bgs)	Step Test Date	Begin Constant Rate Test	End Constant Rate Test	Average Extraction/Injection Rate (gpm)
G-EW-1	Extraction	Gage	144	197	08/30/06	09/11/06 11:20	09/16/06 10:37	186
BF-EW-1	Extraction	Bellflower	85	128	09/27/06	10/05/06 13:00	10/09/06 18:20	48
BF-IW-1	Injection	Bellflower	107	125	03/26/07	03/29/07 10:00	04/01/07 16:28	110
G-IW-1	Injection	Gage	138	163.5	04/10/07	04/12/07 09:25	04/17/07 11:31	180

**Table 2**

**Completion Details  
Transducer-Equipped Wells**

Boeing Realty Corporation, Former C-6 Facility  
Los Angeles, California

Well I.D.	Water Bearing Unit	Easting <sup>1</sup>	Northing <sup>1</sup>	Reference Elevation (MSL) <sup>2</sup>	Boring Total Depth (feet)	Screen Depth Interval (feet)	Depth to Top of Filter Pack (feet)	Casing Diameter (inches)	Casing Type	Slot Size (inches)	Drilled Date
MWB012	B-Sand	6,470,031	1,769,026	52.43	90.5	64.5-84.5	62	4	Sched 40 PVC	0.02	05/17/2004
MWB019	B-Sand	6,469,966	1,768,100	55.18	90.5	65-85	62	4	Sched 40 PVC	0.02	05/17/2004
TMW_11	B-Sand	6,470,717	1,768,211	49.85	83	58-78	55	2	Sched 40 PVC	0.01	02/01/1999
WCC_9S	B-Sand	6,470,680	1,769,416	57.39	92	60-90	55	4	Sched 40 PVC	0.01	09/21/1989
CMW0001	C-Sand	6,470,696	1,768,190	54.37	124	99-124	97	4	Sched 40 PVC	0.01	08/15/2003
MWC009	C-Sand	6,470,654	1,769,372	53.99	125	101-121	97.5	4	Sched 40 PVC	0.02	04/28/2005
MWC015	C-Sand	6,470,300	1,768,828	51.51	128	100-125	126.5	4	Sched 40 PVC	0.02	05/17/2004
MWC017	C-Sand	6,469,975	1,768,100	55.16	128	100-125	99	4	Sched 40 PVC	0.02	05/17/2004
MWG001	Gage Aquifer	6,470,702	1,769,156	54.13	190	156-186	152	2	Sched 40 PVC	0.02	04/22/2005
MWG002	Gage Aquifer	6,470,701	1,768,459	54.78	195	162-192	158	2	Sched 40 PVC	0.02	04/28/2005
MWG003	Gage Aquifer	6,470,052	1,768,923	53.08	185	154.5-184.5	150	2	Sched 40 PVC	0.02	09/12/2005
MWG004	Gage Aquifer	6,470,227	1,768,396	52.05	186	155-185	150	2	Sched 40 PVC	0.02	09/12/2005

<sup>1</sup> California State Plane NAD 83, Zone 5, Feet

<sup>2</sup> MSL denotes Mean Sea Level



Table 3

**Summary of Manual Water Level Measurements**  
 Boeing Realty Corporation, Former C-6 Facility  
 Los Angeles, California

Water Bearing Unit	Well I.D.	Date Measured	Reference Elevation (MSL) <sup>1</sup>	Depth to Water (feet)	Ground Water Elevation (MSL)
B-Sand	MWB-012	08/30/06	52.43	61.00	-8.57
		09/08/06	52.43	60.99	-8.56
		09/19/06	52.43	61.19	-8.76
		10/04/06	52.43	60.94	-8.51
		10/18/06	52.43	61.03	-8.60
		11/15/06	52.43	60.80	-8.37
		03/28/07	52.43	60.38	-7.95
		04/05/07	52.43	60.31	-7.88
		04/24/07	52.43	60.41	-7.98
	MWB-019	08/30/06	55.18	64.45	-9.27
		09/08/06	55.18	64.45	-9.27
		09/19/06	55.18	64.51	-9.33
		10/04/06	55.18	64.38	-9.20
		10/18/06	55.18	64.43	-9.25
		11/15/06	55.18	64.26	-9.08
		03/28/07	55.18	63.73	-8.55
		04/05/07	55.18	63.77	-8.59
	WCC-09S	08/30/06	57.39	65.32	-7.93
		09/08/06	57.39	65.27	-7.88
		09/19/06	57.39	65.41	-8.02
		10/04/06	57.39	65.24	-7.85
		10/18/06	57.39	65.36	-7.97
		03/23/07	54.96	62.26	-7.30
		04/05/07	54.96	62.18	-7.22
		04/24/07	54.96	62.35	-7.39
	TMW-11	08/30/06	49.85	58.70	-8.85
		09/08/06	49.85	58.71	-8.86
		09/19/06	49.85	58.85	-9.00
		10/04/06	49.85	58.58	-8.73
		10/18/06	49.85	58.73	-8.88
		11/15/06	49.85	58.45	-8.60
		03/23/07	49.85	58.13	-8.28
		04/05/07	49.85	58.03	-8.18
		04/24/07	49.85	58.13	-8.28

Table 3

**Summary of Manual Water Level Measurements**  
 Boeing Realty Corporation, Former C-6 Facility  
 Los Angeles, California

Water Bearing Unit	Well I.D.	Date Measured	Reference Elevation (MSL) <sup>1</sup>	Depth to Water (feet)	Ground Water Elevation (MSL)
C-Sand	CMW-001	08/30/06	54.37	63.61	-9.24
		09/08/06	54.37	63.64	-9.27
		09/19/06	54.37	63.74	-9.37
		10/04/06	54.37	63.58	-9.21
		10/18/06	54.37	63.68	-9.31
		11/15/06	54.37	63.41	-9.04
		03/23/07	54.37	63.09	-8.72
		04/05/07	54.37	63.06	-8.69
		04/24/07	54.37	63.18	-8.81
	MWC-009	08/30/06	53.99	62.23	-8.24
		09/08/06	53.99	62.21	-8.22
		09/19/06	53.99	62.35	-8.36
		10/04/06	53.99	62.21	-8.22
		10/18/06	53.99	62.23	-8.24
		11/15/06	53.99	61.99	-8.00
		03/23/07	53.99	61.65	-7.66
		04/05/07	53.99	61.67	-7.68
		04/24/07	53.99	61.82	-7.83
	MWC-015	08/30/06	51.51	60.23	-8.72
		09/08/06	51.51	60.23	-8.72
		09/19/06	51.51	60.34	-8.83
		10/04/06	51.51	60.17	-8.66
		10/18/06	51.51	60.26	-8.75
		11/15/06	51.51	59.99	-8.48
		03/28/07	51.51	62.48	-10.97
		04/24/07	51.51	61.22	-9.71
	MWC-017	08/30/06	55.16	64.44	-9.28
		09/08/06	55.16	64.45	-9.29
		09/19/06	55.16	64.58	-9.42
		10/04/06	55.16	64.43	-9.27
		10/18/06	55.16	64.48	-9.32
		11/15/06	55.16	64.27	-9.11
		03/28/07	55.16	63.98	-8.82
		04/05/07	55.16	63.94	-8.78
		04/24/07	55.16	64.03	-8.87

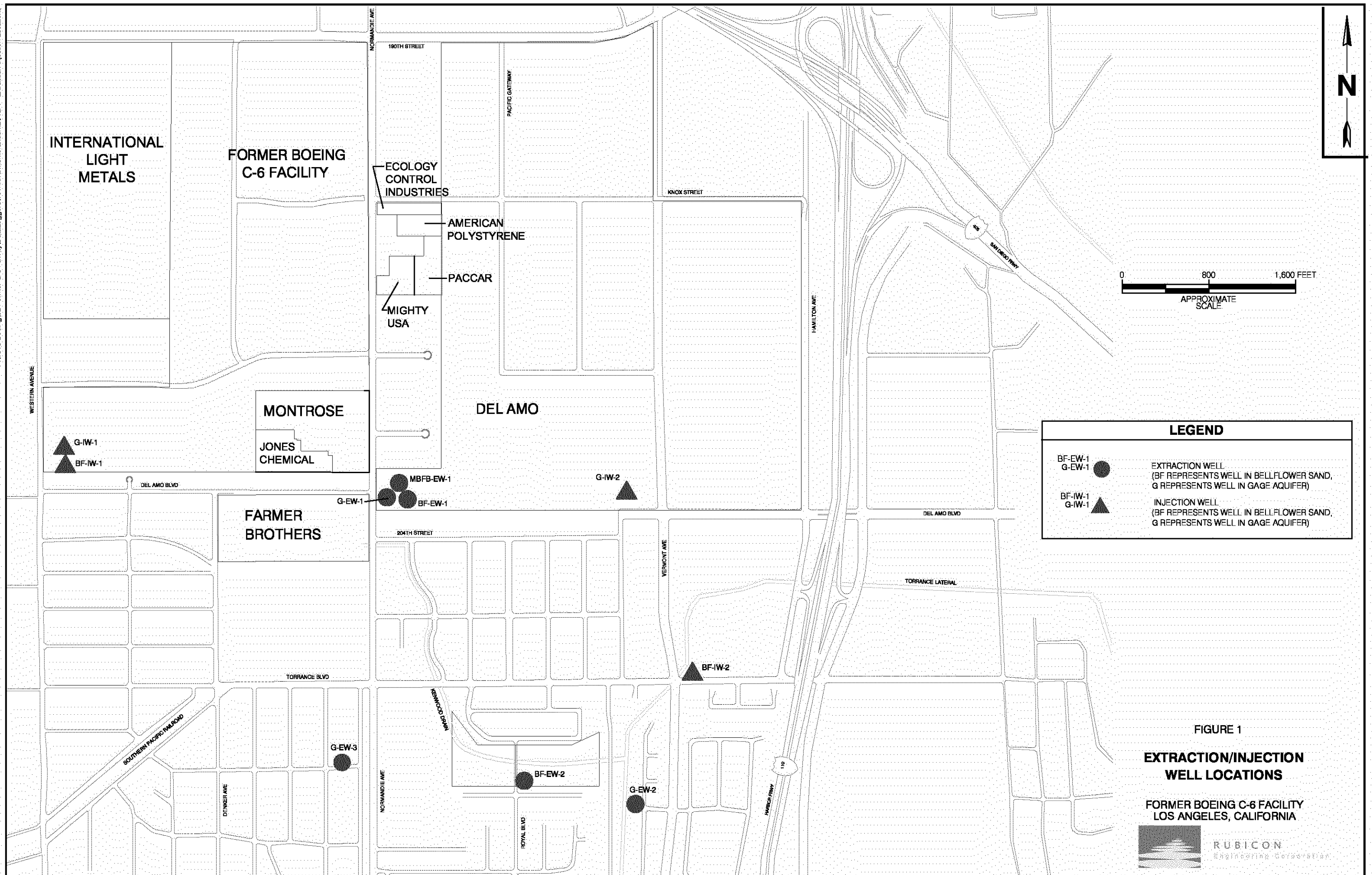
Table 3

**Summary of Manual Water Level Measurements**  
 Boeing Realty Corporation, Former C-6 Facility  
 Los Angeles, California

Water Bearing Unit	Well I.D.	Date Measured	Reference Elevation (MSL) <sup>1</sup>	Depth to Water (feet)	Ground Water Elevation (MSL)
Gage	MWG-001	08/30/06	54.13	63.58	-9.45
		09/08/06	54.13	63.57	-9.44
		09/19/06	54.13	63.71	-9.58
		10/04/06	54.13	63.56	-9.43
		10/18/06	54.13	63.52	-9.39
		11/15/06	54.13	63.34	-9.21
		03/23/07	54.13	63.07	-8.94
	MWG-002	08/30/06	54.78	64.60	-9.82
		09/08/06	54.78	64.61	-9.83
		09/19/06	54.78	64.74	-9.96
		10/04/06	54.78	64.59	-9.81
		10/18/06	54.78	64.57	-9.79
		11/15/06	54.78	64.39	-9.61
		03/23/07	54.78	64.11	-9.33
	MWG-003	08/30/06	53.98	62.42	-8.44
		09/08/06	53.98	62.45	-8.47
		09/19/06	53.98	62.57	-8.59
		10/04/06	53.98	62.43	-8.45
		10/18/06	53.98	62.40	-8.42
		11/15/06	53.98	62.23	-8.25
		03/23/07	53.98	61.99	-8.01
	MWG-004	04/24/07	53.98	62.12	-8.14
		08/30/06	52.05	61.65	-9.60
		09/08/06	52.05	61.68	-9.63
		09/19/06	52.05	61.82	-9.77
		10/04/06	52.05	61.67	-9.62
		10/18/06	52.05	61.65	-9.60
		11/15/06	52.05	61.48	-9.43
		03/23/07	52.05	61.20	-9.15
		04/05/07	52.05	61.23	-9.18
		04/24/07	52.05	61.35	-9.30

<sup>1</sup> MSL denotes Mean Sea Level.

# *Figures*



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